Foraminiferal oxygen and carbon isotope records in the northwestern Pacific during the last 30 kyrs

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There is no deep water production in the present North Pacific. The North Pacific Intermediate Water (NPIW), defined as the salinity minimum at depth of 300-800 m, is formed in the northwestern Pacific. The origin of the NPIW, thought to be low-salinity cold intermediate water,formed in the Okhotsk Sea. The Pacific intermediate circulation may have changed significatly during the glacial periods. Keigwin (1988) documented the existence of well-ventilated water mass in deoth shallower than 2 km in the glacial Okhotsk Sea of the northwestern Pacific. It is important to reconstruct glacial-interglacial change in the ventilation of intermediate water in the Oyashio current area of the northwestern Pacific to better understand global climate changes, because this area would be directly affected by hydrographic changes in the Okhotsk Sea and the open Pacific Ocean. Changes in foraminiferal oxygen and carbon isotope in this area provide critical information on the relative strength of the intermediate water circulation in the past North Pacific. Here, we present benthic and planktic foraminiferal oxygen and carbon isotope records for the last 30 kyrs from MR01-K03 PC4, off Shimokita Peninsula (water depth: 1363 m). The core length is 1334 cm. The sediment is entirely composed of olive gray, bioturbated massive diatom bearing silty clay. Planktic foraminifera were picked from 9 layers for AMS dating. Planktic 14C ages show that the core recorded paleoenvironmental changes during the last glacial period. The linear sedimentation rate (LSR) was calculated from the radiocarbon data. The LSR during the last glacial period is generally high with about 44-64 cm/kyr. The benthic foraminifera Uvigerina akitaensis and the planktic foraminifera Neogloboquadrina pachyderma (sinistral) are selected for oxygen and carbon isotope analyses. Samples were taken at 0.5-1.0 kyr intervals for measurement, picked for U. akitaensis (2-3 specimens per samples) and N. pachyderma (20-30 specimens per samples) from the 212 and the180-212 micrometers fractions, respectively. Oxygen and carbon isotopic compositions were measured on a Finnigan MAT252 fitted with an online automated carbonate preparation device at the Mutsu Institute for Oceanography. The analytical precision of the system was better than 0.07 per mils for oxygen isotopic values and 0.04 per mils for carbon isotopic values. Sample gases were calibrated for every run using NBS-19 reference samples, and all results are expressed in the d-notatipon as per mil deviation from PDB, using standard procedures. d18O values of both U. akitaensis and N. pachyderma are high and almost uniform during the last glacial period, then decrease until reaching minimum at 4 ka B. P. The average d18O values during the last glacial period are 3.4 per mils for N. pachyderma and 4.8 per milsfor U. akitaensis. The difference in the d18O values between U. akitaensis and N. pachyderma reached about 0.5-1.6 per mils during the last 30 kyrs.d13C values of U. akitaensis (range from -1.9 to -0.9 per mils) exhibit 2 to 4 kyr-scale oscillations during the last glacial to deglacial period. The record is punctuated by negative excurisions in 21, 16, 14, 12 and 9 ka B. P.,respectively. d13C record of N. pachyderma (range from -1.2 to 0.3 per mils) is also punctuated by several negative excursions occured in 21, 18 16 and 13 ka B. P., respectively. The most negative U. akitaensis d13C value shift (to -0.7 per mils) coincide with N. pachyderma d13C shift (to -1 per mil) in 21 ka B. P.